

Statement of Purpose

My fascination with computers began when my sister bought a laptop that was preloaded with Ubuntu, an operating system I had never even heard the name of before and, admittedly, sounded kind of funny. As I tinkered with Ubuntu, I discovered the terminal, and along with it, a command that could let me watch the entirety of Star Wars in ASCII. I was instantly hooked to Linux and started using Arch Linux as my daily driver by the age of 17. This journey of exploration and customization taught me not just technical skills but also the value of problem-solving, perseverance, and thinking creatively. It was during this period that I stumbled upon Kaggle; a platform dedicated to machine learning. From forecasting stock market trends to optimizing urban transportation systems, I became fascinated by how ML could turn seemingly aleatory variables into actionable insights. Now, as a Computer Engineer working for a non-profit, it is my keen desire to gain expertise in machine learning to ensure that the benefits of data-driven decision making are more accessible, inclusive, and transparent. Thus motivated, I seek admission to the Master of Science program from the prestigious Northeastern University.

Driven by a keen interest in technology, I pursued my undergraduate degree in Computer Science from the Smt. Kashibai Navale College of Engineering affiliated to the prestigious Savitribai Phule (Pune) University. I found my undergraduate curriculum deeply interesting, and naturally found subjects such as Data Science and Machine Learning especially absorbing. My passion for Mathematics has driven me to excel, and I have achieved superior academic grades in each of my Math courses. Other aspects of my curriculum, such as academic evaluation through individual and team-based projects, also taught me efficient time-management, resource-allocation, and crucial interpersonal skills—lessons that have extended far beyond the academic context in which they were learnt.

During my third year, my lab course in Database Management Systems, which included working with SQL and NoSQL databases and designing ER diagrams, helped me to develop a strong understanding of data management and querying techniques. In other lab courses, I implemented CPU scheduling algorithms, memory placement strategies, and page replacement algorithms. During the study of Data Science and Big Data Analytics, which served as a precursor course for Machine Learning, I explored important libraries like Pandas, Matplotlib, NumPy, and Seaborn. While I had had some former experience in Machine Learning in the form of projects, its formal inclusion in my final year curriculum enabled me to envisage multiple applications for this transformative technology, and crystallized my desire to seek higher education in the field.

Amongst the first projects that gave me an insight in the operationalization of these advanced technologies was a project I called 'Fitform'. The objective of the project was to apply techniques of Computer Vision using the OpenCV library to analyse and correct body form during push-ups in real time used to improve training and reduce risk of injuries. I calculated joint angles, and utilized basic geometric principles to create an algorithm that assessed provided feedback on the correct body form. In addition to sharpening my skills in Computer Vision, the project helped me to interpret kinesics through a technological lens, which was a novel and instructive experience. Another bonus was that it genuinely improved my push-up form after a few weeks of regular use.

Motivated by my interest in the stock market, I undertook a significant project during the former part of my final year. It was the analysis of the Indian stock market, and the building of a prediction model for the Nifty50 index. While conducting preliminary research for my project, I realized that time series analysis models offered the best accuracy for the analysis of stock markets. Applying Deep Learning models specifically designed for time-series data, such as Recurrent Neural Networks (RNNs) and Long Short-Term Memory networks (LSTMs), I was able to experiment with various techniques for forecasting trends in the stock market, and evaluate their varying accuracies in predicting complex, non-linear data patterns. The project gave me insights in the unique challenges inherent in the prediction of stock markets, and served to highlight the need for feature engineering to account for volatility and external economic factors.

Execution of my capstone project titled “Echo Speak: Real-Time Speech to Speech Translation using Voice Cloning” was a key milestone in my academic journey. This team project, aimed to enable real-time, cross-lingual communication by implementing voice cloning techniques to preserve the speaker’s original voice while providing accurate translations, thus ensuring that nuances inherent in pitch, intonation, and modulation remained intact. The underlying motivation for the project was to facilitate greater access to educational materials by remote rural communities where proficiency in English was likely to be limited. We utilised Azure Speech Services for real-time translations from English to Marathi and Hindi, along with OpenVoice for voice cloning, thus obviating the need to train models from scratch, and allowing seamless integration. This project refined my skills in Natural Language Processing, Deep Learning, and Cloud-based AI services. Papers based on this project have been accepted for publication in two reputed journals, giving me a keen sense of accomplishment, and whetting my appetite for more such contributions.

My internship at the Ed-Tech platform where I worked on a web development sandboxing tool using HTML, CSS and JavaScript gave me hands-on exposure to the web development process and enhanced my understanding of web development fundamentals. Exposure to industry standards, observing the work of cross-functional teams, and an insight in the navigation of team dynamics were other key takeaways from this internship.

Subsequent to my graduation, as I await admission to graduate school, I have chosen to from low-income communities in the field of education volunteer at the Akanksha Foundation, a non-profit organization which works with children. In this role, I teach Mathematics and Science to high school students from underprivileged backgrounds. During my stint, I have also taken the initiative to organize a two-week coding bootcamp for these students to help them kick-start their programming journeys. Replicating my own journey in a microcosm, I teach C++, and the basics of Python, which culminate in a mini-project. Teaching eager, aspiring students has been an enriching journey that has inspired me through their curiosity and enthusiasm, and strengthened my resolve to ensure equity in the distribution of the fruits of digital advancement.

As I recount my academic journey, I realize that my interests and background make me an excellent fit for the MS program in Computer Science at Northeastern University. My proficiency in Mathematics, and passion for Machine Learning equip me for success in a wide array of fields that deploy data-driven decision-making such as finance, healthcare, manufacturing, and several other impactful areas. I have found the work of Prof Yanzhi Wang in Energy-efficient and high-performance implementation of deep learning systems especially well-aligned with my interest in Machine Learning and Deep Learning, and look forward to learning from him. Prof Yanzhi Wang’s work in model compression of DNNs is inspiring in the breadth of its potential, and I would be honoured to earn his mentorship. In addition to

instruction from erudite teachers and world-class research facilities, the programs flexible curriculum, emphasis on interdisciplinary collaboration and access to the vast network of accomplished alumni across academia and industry provides a unique opportunity to gain industry insights while acquiring technical skills. Admission to the MS program in Computer Science at Northeastern University will empower me with the tools for a successful professional career.